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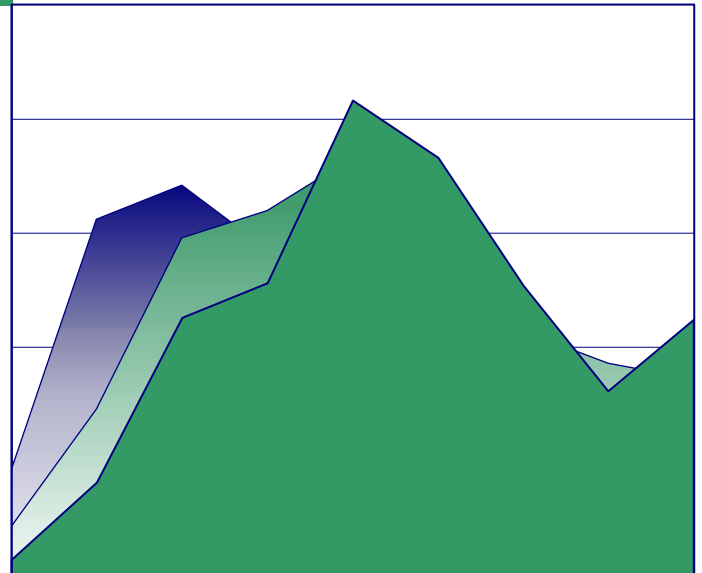
**Dental Health Policy Analysis Series**

**The Economic Aspects of  
Unsupervised Private  
Hygiene Practice and Its  
Impact on Access to Care**

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# The Economic Aspects of Unsupervised Private Hygiene Practice and Its Impact on Access to Care

## DENTAL HEALTH POLICY ANALYSIS SERIES

Series Editors: L. Jackson Brown, Vickie Lazar

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# **ABSTRACT**

## **BACKGROUND**

The unsupervised practice of dental hygiene at locations remote from a dental office is a relatively new occupational choice in the United States. This article reports on a study that analyzed the economic aspects of unsupervised private hygiene practice and its impact on access to care in Colorado where this type of practice is permitted.

## **METHODS**

The authors developed a theoretical model of unsupervised practice of dental hygiene that describes the economic characteristics of this mode of practice. They collected and analyzed data from existing unsupervised dental hygiene practices in Colorado, as well as from nearby dentists.

## **RESULTS**

The authors identified 17 practices of unsupervised hygienists in Colorado that were separate from dentist's offices and did not include supervision by a dentist. The practices included 20 hygienists because some practices had more than one hygienist. Prophylaxis fees for adult patients were generally similar for unsupervised hygienists and neighboring dental practices. Prophylaxis fees for children were largely similar for unsupervised hygienists and neighboring dental practices, but three unsupervised hygienist practices were distinctly different in their fees for children. Two practices had fees that were greater than the average of those of neighboring dentists and one was less than the average of neighboring dentists.

## **CLINICAL IMPLICATION**

Unsupervised private dental hygiene practice has not had a notable effect on access to care in Colorado. The impact of those practices is limited in two important ways: 1) there are very few practices; and 2) they are located in areas served also by dental offices with traditional dental hygienists. The economic viability of the unsupervised hygienist business model is questionable because their prophylaxis fees, on average, are not different from traditional dental practices, which have the advantage of providing a full range of practice services. This may explain why independent hygienist practices have not expanded substantially in a state where they are permitted.

## INTRODUCTION

The traditional role of a dental hygienist has been that of a member of a dental team employed in a dental practice. The current practice model places the dentist as the head of the practice of dentistry in the office and as the supervisor of the dental team (which includes dental hygienists, dental assistants, laboratory technicians and other dental staff members).

Differences in the supervision of dental hygienists within the current practice model reflect both state dental practice acts and the styles of practicing dentists. Supervision of the work of hygienists can vary from relatively strict supervision of hygienists and their patients to indirect supervision that allows flexibility regarding work and patient conditions within the dental practice.

A relatively new occupational choice is that of less supervised or unsupervised practice of dental hygiene at locations remote from a dental office. These range in degree of dentist's supervision, from indirect and periodic review of hygiene services performed by a hygienist while a dentist is not present in the office to a broad collaborative relationship between a hygienist and a dentist, with the hygienist practicing at a location remote from the dentist. Truly unsupervised practice of hygienists implies the practice of dental hygiene independent

of the dentist and the dental practice. Currently, however, Colorado is the only state that permits unsupervised dental hygiene practice.<sup>1</sup>

This study addresses the economic viability and the characteristics of unsupervised private practice of dental hygiene by dental hygienists in Colorado. Unsupervised hygiene practices in other circumstances, such as community health centers, are not addressed by this study.

## CONCEPTUAL FRAMEWORK

### Definition of Unsupervised Practice

According to one definition of unsupervised practice, a hygienist operates a dental hygiene practice in facilities within which a dentist does not practice. This is the stand-alone hygienist practice, located in a facility designed only for hygienists. The practice is owned and operated by a dental hygienist. A licensed dentist does not have any ownership or management responsibilities and is not present during the time in which the practice is open for business.

Alternatively, the dental hygienist could operate an unsupervised practice within the facilities of a dental practice but operate only when the dental practice is not open for

business. An example would be a hygienist who leases a dentist's facilities a few nights per week and perhaps on weekends. The owner-dentist is never present during these times, and thus it is not possible for the patient to receive preventive services and diagnostic services in the same sitting. The main advantage to the hygienist of practicing within the facilities of the dental practice is the cost efficiencies of leasing a dental practice facility instead of establishing different facilities.

Finally, a hygienist could provide services to an institution or organization on a contractual basis. In this model, the hygienist is reimbursed according to a fee schedule or capitated arrangement to provide preventive services to a specific population or defined patient group, such as nursing home residents, schoolchildren or patients in behavioral health or long-term care facilities. The hygienist operates out of existing institutional facilities or uses portable or mobile equipment.

### Economic Theory

An economic consideration of hygienists' services first requires an understanding of the demand side of the market. There are four economic concepts that are important for understanding the economics of unsupervised dental hygiene practice. These are substitutes, complements, scope of service and combining of services.

<sup>1</sup> Colorado State Dental Practice Act, Paragraph 12-35-122.5.

*Substitutes.* In economics, a good or service is said to be a substitute for another kind, insofar as the two kinds can be consumed or used in place of one another in at least some of their possible uses—for example, margarine and butter.<sup>2</sup> The fact that one good can be substituted for another has immediate economic consequences insofar as the professional services of the hygienists are concerned.

For preventive services, the services of the hygienist and the services of the dentist might be viewed as interchangeable economic substitutes. The patient may be well served by the services of either professional. The dentist can serve as a substitute provider for the hygienist just as the supervised hygienist can serve as a substitute provider to the unsupervised hygienist. More importantly, the services of the supervised hygienist can be viewed as a perfect substitute for the services of the unsupervised hygienist – that is, they both provide equivalent services. Therefore, the unsupervised hygienist can gain a competitive advantage only by charging lower fees or by providing services where a dental practice is not present in the same local area or at times when a dental practice is not open for business.

*Complements.* Complementary services are the opposite of substitutes.<sup>2</sup> They are used together. An example of complementary goods is hamburgers and hamburger buns. If the price of hamburgers falls, more hamburgers will be bought. This, in turn, means more hamburger buns would be sold because the two usually are used together.

For certain combinations of professional dental services, the services of the hygienist and dentists are viewed as complementary services. A patient commonly receives the services of the hygienist in conjunction with the diagnostic services of the dentist, sometimes followed with restorative or other services. A decrease in the fee for a dental prophylaxis provided by the hygienist is expected to result in an increase in the demand for the diagnostic and restorative services of the dentist. This occurs because prophylaxes are usually provided together with oral examinations. The increase in restorative services results because the examination will detect needed therapy. That is one reason that individuals who have not visited a dentist for a considerable period are likely to have more untreated disease. It is in this economic sense that preventive services are complementary to examinations and therapeutic dental services.

*Scope of services.* The two previous concepts are related to the third concept of scope of services. The scopes of services the two types of practices can provide are markedly different. Except for certain services that require a specialist, a dental practice offers a broad range of services. This service scope creates a one-stop shopping environment. Alternatively, unsupervised dental hygienists are permitted only a limited range of services.

Some state practice acts allow hygienists to gather and assemble information that includes “oral inspection.” While this allowance assumes some level of screening competence among hygienists, a thorough diagnosis is limited to the services of the licensed dentist. For this reason, for diagnostic services, the services of the hygienist and the services of the dentist are not substitutes but complements—that is they go together, when one occurs the other is likely to occur also.

*Combining services.* This is where combinations of services become important. For the patient, there is a benefit from the provision of preventive services and at least diagnostic services at a single sitting. When such services are provided together, the relation between the fee for the prophylaxis and the demand for diagnostic services becomes stronger than when

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<sup>2</sup> Stiglitz JE. Economics. 2nd ed. W.W. New York: Norton & Company; 1993: 78-80, 268, 271-72.

unbundled.<sup>3</sup> That is, the complementary relation between the two services is greater when the two services are provided at the same “point of sale.”

For the patient, there are clear advantages to the efficient combination of hygienist’s services and the dentist’s diagnostic services.<sup>2</sup> The patient is able to receive the services of the dentist and the hygienist in the same dental visit, thereby reducing the patient’s waiting time, travel time and associated transportation expenses. The range of services that a practice can provide becomes important when the patient receives the services of both professionals. For the patient who seeks the services of the hygienist without the diagnostic services of the dentist, there are no economies of scope from the patient’s point of view.

*Economic viability.* One important economic question for this study is: Can unsupervised private dental hygiene practice be economically viable on a large scale? The second important question is: Can unsupervised private dental hygiene practice have a notable impact on access to care for the underserved?

The two questions are related. Unless unsupervised private dental hygiene practice is economically viable, it will not

expand very much. To be economically viable, this mode of practice must provide hygienists with a competitive income to traditional hygiene practice and patients must find the utilization of the services of unsupervised dental hygienists advantageous. Further, unless unsupervised dental hygiene practice expands, it cannot have a notable impact on access to care. No matter the laudable motivation, a small number of these practices can provide only a limited amount of services, compared to the needs of tens of thousands of underserved citizens of Colorado.

Tying the four economic concepts together forms the foundation for an assessment of both questions. The comparative fees for prophylaxes between unsupervised private dental hygiene practices and traditional hygiene services from dental practices are critical. Here is why. Together with the number of services provided, the fees of unsupervised dental hygienists are the source of income for the practice. The fee must be large enough to cover expenses or the practice will fail. Even if it does cover expenses, it must be high enough compared to the fees of the traditional hygienist to provide a strong incentive to establish an unsupervised private practice. This means the fee level in combination with the patient load must generate enough income to cover the increased expense of

owning one’s practice and still provide a competitive income.

However, if the fees of unsupervised practices are not lower than the fees of hygienists in dental offices, patients will not have an incentive to unbundle services that go together, such as prophylaxes and examinations. They will opt for the one-stop shopping with its built-in efficiency in time and effort.

Therefore, the fundamental operational question is: Are the fees of unsupervised hygienists lower than those of traditional hygienists? If they are not, then not many hygienists will have an incentive to establish unsupervised practices and not many patients will have an incentive to seek the services of the unsupervised hygienist in place of the services offered by a dental practice.

## **METHODS AND SUBJECTS**

### **Identification of Dental Hygienists**

The Colorado Dental Association, the Colorado Dental Hygiene Association, the Colorado Department of Public Health and Environment were contacted to determine if they had a list of unsupervised dental hygiene practices. A list of unsupervised dental hygienist practice could not be located. Thus, a list of potentially unsupervised practices had to be developed. Once this list

<sup>3</sup> Carlton DW, Perloff JM. Modern industrial organization. 3rd ed. Reading, Mass.: Addison-Wesley; 2000: 379.



was developed, follow-up telephone contacts differentiated the original list of practices into those that were truly unsupervised and those that did not meet criterion described earlier. Two approaches were employed to locate dental hygiene practices that were possibly unsupervised.

The first effort was based on an examination of local telephone yellow pages throughout Colorado. A total of 24 hygienists and practices were tentatively identified as possibly unsupervised. Those practices were interviewed, and six practices were found to be unsupervised. Since a review of the yellow pages could have yielded an incomplete identification of unsupervised dental hygiene practices, further search methods were employed.

A second effort was based on a list of all actively licensed dental hygienists residing in Colorado. The list was obtained from the Colorado Department of Public Health and Environment and contained 2,702 individual hygienists with active Colorado licenses with addresses in Colorado. Telephone numbers were missing for 385 dental hygienists on the list. An additional 294 phone numbers and addresses were incorrect, and one hygienist was reported deceased.

The remaining 2,022 hygienists represent the list of eligibles for the study and attempts were made to contact them all. A total of 1,443 screening interviews were completed, resulting in a response rate of 71.4%. Only 105 hygienists refused to answer the questions and 474 could not be contacted after repeated phone calls at various times of the day and week. Table 1 displays the disposition status of the actively licensed hygienists.

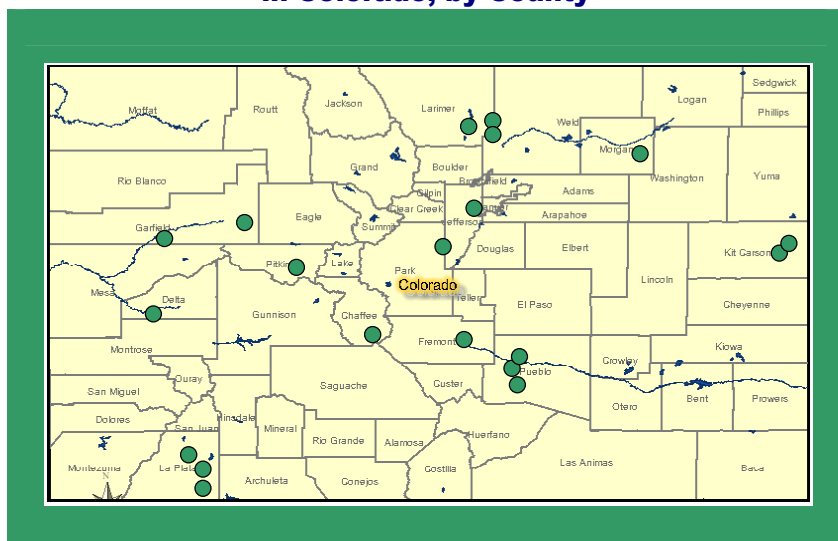
Of the 1,443 respondents to the initial screening survey, 28 were tentatively identified as possibly unsupervised. Subsequent telephone follow-up determined that only 16 were truly independent.

**Table 1: Disposition Table**

<b>Total Number of Hygienists</b>	<b>2,702</b>
No Available Phone Number	385
Disconnected or Incorrect Phone Number	294
Deceased	1
<b>Eligible Hygienists Telephoned</b>	<b>2,022</b>
Respondents	1,443
No Answer	474
Refusal	105
<b>Response Rate</b>	<b>71.4%</b>

The dental hygiene practices identified by both efforts were pooled and unduplicated. It was determined that 20 dental hygienists practicing in 17 practices were truly independent as defined in this paper. In Figure 1, the green circles illustrate the location of the 20 unsupervised dental hygienists.

**Figure 1: Location of Unsupervised Dental Hygienists in Colorado, by County**





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### Collection of Data from Dental Hygienists

Trained telephone interviewers conducted interviews with the respective contacts at each of the locations where possible. Calls were made during normal business hours in Colorado (Mountain time). The first set of calls to hygienists identified using yellow page listings was made in April 2004 and August 2004. The larger set of calls from the complete list of actively licensed dental hygienists was made in January 2005. A minimum of three, but often five, callbacks were made during each set of calls in an attempt to reach practices that did not respond to the phone rings. The telephone interviewers were directed to call back at different times or on different days.

For each hygienist, the telephone interviewer requested information regarding the availability of a dentist to check for any problems in order to avoid a separate visit somewhere else. The response to the question provided a basis for determining if there was a dentist in the practice at the time the hygienist was performing services. If a dentist were not available and a separate visit would have to be scheduled, then that practice was determined to be unsupervised.

Other key data collected from the practices of unsupervised dental hygienists included the following elements:

- ✦ Fee charged for adult prophylaxis.
- ✦ Fee charged for child prophylaxis.
- ✦ Length of time to get an appointment.
- ✦ Provision of radiographs.
- ✦ Location and ease of access to practice.
- ✦ Hours/days during which the practice is open.
- ✦ Repeat care with same hygienist—the patient returned to the hygienist for continuing preventive services.

The fee charged by unsupervised hygienists affects their ability to attract patients and earn an acceptable income. Together with the number of patients, the fee charged determines the practice revenue. As explained earlier, in a competitive marketplace, it would be difficult for an unsupervised dental hygiene practice that charges fees greater than those of hygienists affiliated with the neighboring dentists to compete for patients because most patients will choose the less expensive care with the dentist where they can receive the full range of services they may require.

Waiting time for an appointment and practice hours (measured both as the number of days per week and the number of hours per day the practice is open) are two indicators of the patient's ease of access to the unsupervised

practitioner. These two variables also relate information about the work level of the unsupervised hygienists.

Taking on-site radiographs by unsupervised hygienists tends to reflect the extent of services provided by unsupervised dental hygienists. It also indicates the extent of investment by the hygienist in dental equipment in addition to chairs, lights and instruments. Hygienists leasing space from a dental practice likely did not make such an investment in equipment. To that extent, those practices are subsidized.

The location of the unsupervised hygienist and ease of finding the practice tend to reflect the ease of access by patients but also may reflect the nearness of the practice to other dentists and other practices. None of the unsupervised dental hygienists' practices were in difficult-to-find locations.

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### Collection of Data From Private Practice General Practitioners

As part of the assessment of the unsupervised practice of dental hygiene, we also collected similar information from dental offices located near the dental hygiene practices. Using data from the ADA's latest edition of *Distribution of Dentists in the United States by Region and State*,<sup>4</sup>

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<sup>4</sup> American Dental Association, Survey Center. Distribution of dentists in the United States by region and state, 2002 (dataset). Chicago: American Dental Association; 2004.

all private-practice general practitioners in Colorado were identified and then located (or mapped) across the state.

Each hygienist or hygienist practice with the potential of being unsupervised was located by longitude and latitude. All private practice general practitioners were also located by longitude and latitude.

With specialized mapping computer software, market areas were defined by centering each market area around each hygienist or hygienist practice. Formed as circles, the radii were increased until a minimum of 10 neighboring dentists in rural areas and 20 neighboring dentists in urban areas were identified.

The number of dentists in each market area varied since increasing the radius of a circle often identified groups of dentists located near one another. Each dentist within a defined market area was contacted in order to complete the dentist survey portion of the study. A total sample of 384 dentists were selected and contacted, and 279 (73%) provided data.

Data were gathered from dentists prior to final classification of the potential independent dental hygienists. Once *tentatively unsupervised* dental hygienists were classified as *truly independent*, only the information gathered from dentists surrounding those truly

independent dental hygienists were used for data comparisons.

Nearby dentists were included in the study for comparison because fee variation within the state of Colorado is substantial. By limiting the comparisons to hygienists and dentists in same locations, often within a few blocks of one another, we were assured that the fees of both represented the same market conditions.

The telephone survey of the dentists included the following elements:

- ✦ Weekly office hours.
- ✦ Length of initial wait for an appointment.
- ✦ Usual wait to see a dentist after the patient has arrived for a scheduled appointment.
- ✦ Fee for an adult prophylaxis (CDT-4 procedure code D1110).
- ✦ Fee for a child prophylaxis (CDT-4 procedure code D1120).
- ✦ Whether the practice employed a dental hygienist.
- ✦ Whether the responding dentist was aware of any independent or unsupervised hygienists practicing in his or her community.
- ✦ Whether the responding dentist had received any referrals from independent

or unsupervised dental hygienists.

- ✦ Whether the dentist regularly received referrals from independent or unsupervised dental hygienists.
- ✦ If responding dentists indicated being aware of independent/unsupervised hygienists practicing in their community, they were asked to provide any particulars such as name, location/address, phone number and so forth.

The most important comparison variables are the fees for adult and child prophylaxes. Their relative levels are critical to the test of our economic model.

Dentists were also asked about their office hours per week and the wait time for an appointment in order to make comparisons with the data reported by the unsupervised dental hygienists. Longer waits can mean hassles for patients. They are also an indication of the busyness of the practice.

Interviewers asked the dentists to indicate if they were aware of any unsupervised hygienists practicing in their community and whether they received patient referrals from those hygienists. This information provided the means of crosschecking the hygienist survey results regarding their reported dentist referral patterns.

As a final attempt to identify unsupervised dental hygiene practices, interviewers asked dentists to provide location information if they were aware of unsupervised hygienists in their community. This information served also as a rough indication of the extent of interaction between the two types of practices.

## RESULTS

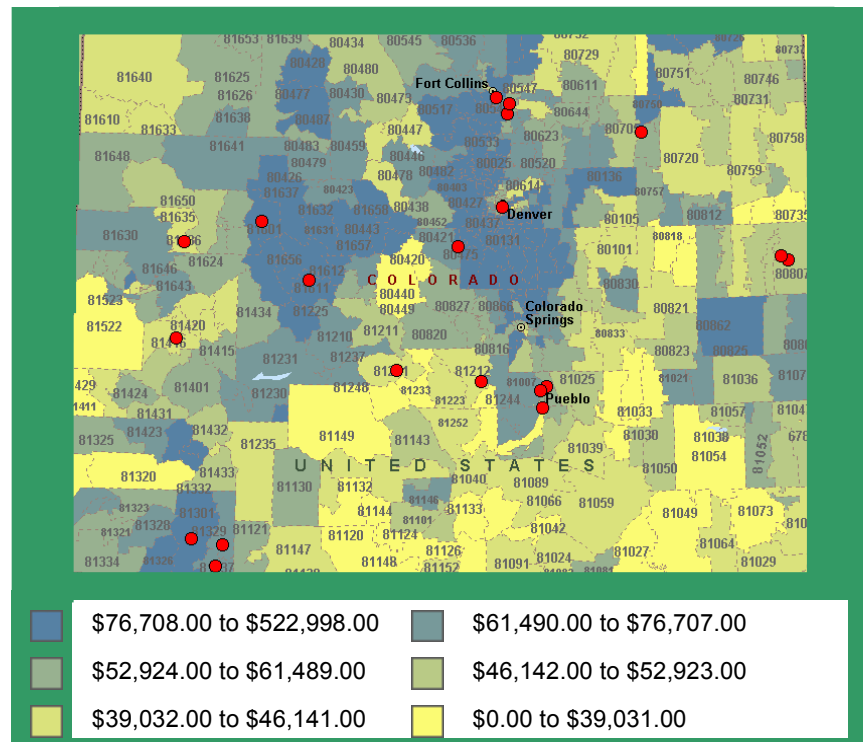
### Selected Characteristics of Counties Where Unsupervised Hygienists Were Located

Figure 2 displays the location of the unsupervised practices (red circles) on a map with the projected 2005 average household income by 5-digit zip code. The map is color-coded by level of income. As the figure indicates the unsupervised hygienist practices are located in largely affluent and middle-income areas. Few are located in lower income zip codes and none are located in zip codes with the lowest average household incomes.

In Colorado, the Hispanic population is the largest minority group. Significant portions of this group are economically disadvantaged. Figure 3 shows percentage distribution of the Hispanic population in Colorado by zip code on a continuous color scale from 0% to 90%. The darkest green areas represent zip codes with the

highest percentages of Hispanics, whereas the lighter areas represent zip codes with the lowest percentages. (The red circles indicate the location of unsupervised dental hygienists.)

**Figure 2: Location of Unsupervised Hygienist Practices in Colorado, by Income Distribution**



**Figure 3: Location of Unsupervised Hygienist Practices in Colorado, by Distribution of Hispanic Population**

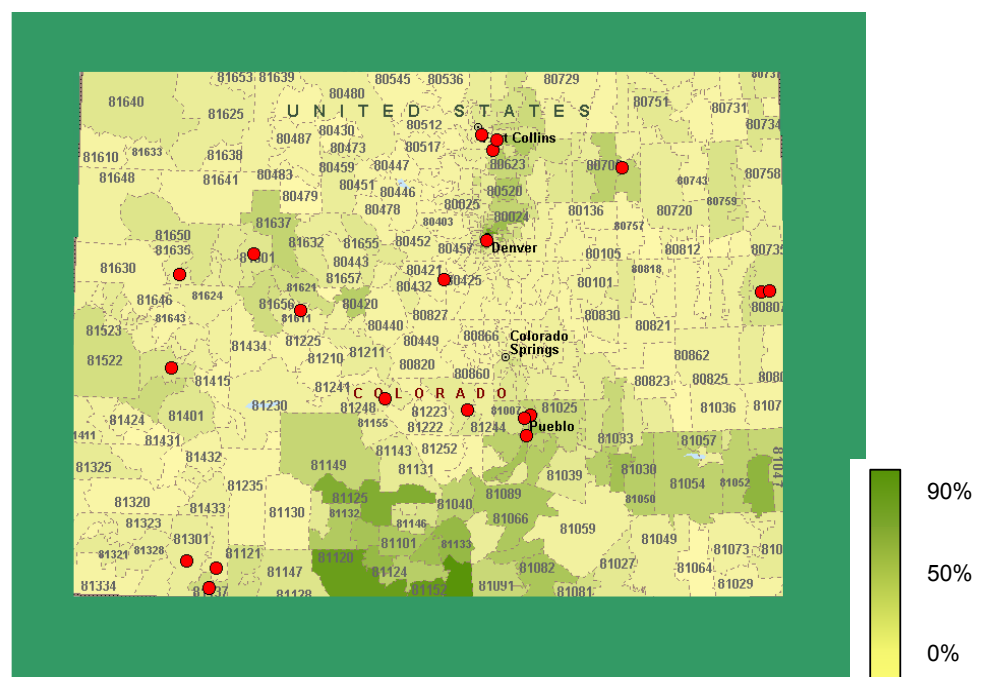


Figure 4a illustrates the locations of unsupervised dental hygiene practices in relation to Colorado counties that HRSA (Health Resources and Services Administration) designates as shortage areas.<sup>5</sup>

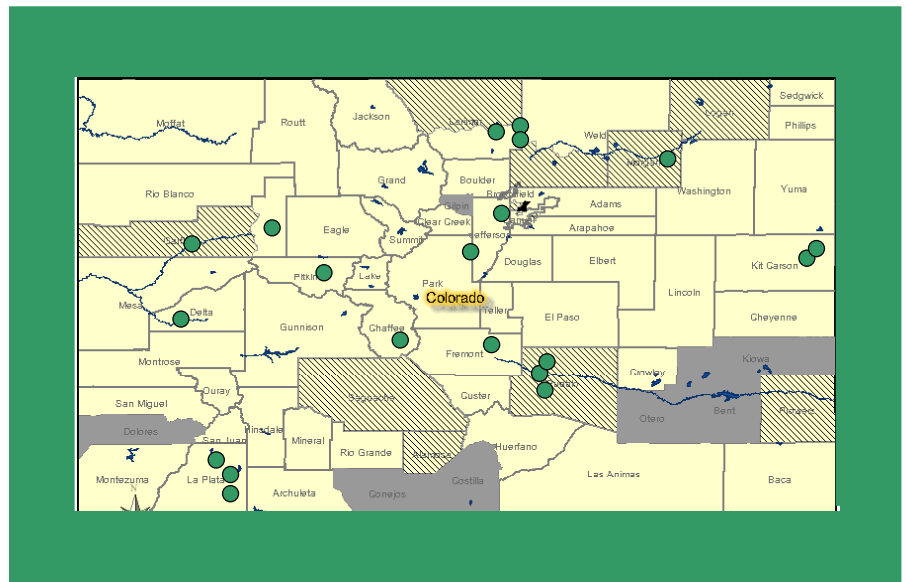
The unsupervised practices are indicated with green circles. Areas that are shaded in gray represent entire counties designated while those that are shaded with horizontal lines represent counties in which only part of the county is designated as a shortage area.

According to HRSA, when the entire county has an overall adjusted dentist-to-population ratio at or below the level set for designation as a shortage area, it is assigned a Whole County Dental Shortage Area Designation. If only part of the geographic area of a county is designated, then it is assigned as a Part County Dental Shortage Area Designation. The designation can be based on two different criteria:

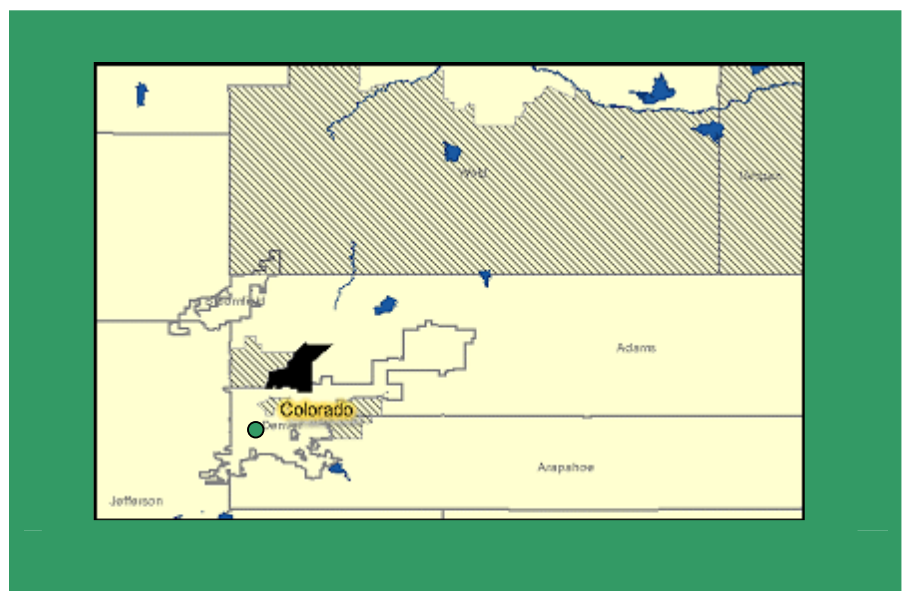
- Geographic Designation:** Census Tracts within the county have an adjusted dentist-to-population ratio at or below the level set for designation as a shortage area.

- Population Designation:** Areas of the county, usually census tracts, with 30% or more of the population at or below the poverty level use a different adjusted dentist-to-population ratio. Parts of counties designated on this basis meet this second dentist-to-population threshold.

**Figure 4a: HRSA Designated Dental Professional Shortage Areas in Colorado**



**Figure 4b: HRSA Designated Dental Professional Shortage Area – Denver County**



<sup>5</sup> U.S. Department of Health and Human Resources, Health Resources and Services Administration. HRSA Geospatial Data Warehouse. Available at: "Countyhttp://datawarehouse.hrsa.gov/DWOnlineMap". Accessed Jan. 20, 2005.



Most of these practices are not located in designated shortage areas; five are located in partially designated counties.

The practice in Denver may be close to facilities or populations that are designated as having dental shortages. Figure 4b shows a closer look at the Denver County borders and the shortage areas within and close to Denver as designated by HRSA. About three sections within this area are designated as a “partial areas” (shaded in backward diagonal lines). However, none of the independent hygienists are located within these areas.

### Analysis of Fee Data

Of the 17 unsupervised dental hygienist practices, sufficient fee information was obtained from 13 practices. All 13 practices provided fees charged for adult patients, and 12 practices provided fees charged for children. These fees were compared to fees charged among neighboring general practitioners in private practice.

For each unsupervised hygienist practice, a group of dental practices were assembled. Among dentists located near the unsupervised dental hygienists (who reported fees), 181 reported fees from which comparisons with unsupervised hygienists’ fees could be made.

The method of analysis is based on the comparison between a single unsupervised hygienist practice and the neighboring dental practices. As a measure

of dentists’ fees among neighboring dental practices, the mean dentists’ fee was calculated for comparison. For each unsupervised hygienist practice, the difference between the hygienist’s fee and the mean dental practice fees was calculated, combined with the standard error of the dentists’ fees. In particular, the following t-statistic was calculated:

$$t = \frac{F_H - F_D}{SD * (1 + 1/n)^{1/2}}$$

where  $F_H$  represents the hygienist’s fee,  $F_D$  represents the mean of the dentists’ fees, SD represents the standard deviation of the dentists’ fees, and n represents the number of dentists. For each unsupervised hygienist practice a t-value was calculated and compared to the appropriate statistical tables for the determination of statistical significance. These calculations were completed for both the adult fees and the children’s fees.

These results indicate considerable variability in unsupervised dental hygienists’ market areas. Variability in dentists’ fees is exhibited also between markets and to a lesser extent within market areas.

*Fees for adult prophylaxis.* Table 2 presents the analysis of the adult fee calculations.

**Table 2: Adult Prophylaxis Fee Analysis**

Practice	t-value	Probability	Significance
A	1.000	0.341	Not Significant
B	1.828	0.209	Not Significant
C	2.799	0.014	Significant
D	0.455	0.655	Not Significant
E	0.129	0.899	Not Significant
F	1.080	0.293	Not Significant
G	0.850	0.413	Not Significant
H	0.120	0.907	Not Significant
I	0.771	0.484	Not Significant
J	1.304	0.249	Not Significant
K	2.520	0.040	Significant
L	0.507	0.626	Not Significant
M	1.684	0.143	Not Significant

The results indicate that there are two market areas (C and K) in which the adult fee from the unsupervised hygienist practice is significantly lower than the mean fee from the neighboring dental practices ( $p < .05$ ). Statistically significant differences were not observed among the remaining eleven market areas.

Note that multiple tests of significance can result in an increased chance of a false positive. That is, a statistical test may indicate that the two fees compared are significantly different when, in fact, they are not. If 20 separate tests were performed at the 5% alpha level, 1 in 20 of the results would be significant by chance alone.

To assess the overall differences between all market areas, an overall statistical test was constructed by summing the negative natural logs of the probabilities, multiplying by two, and comparing this statistic as a Chi-square

statistic.<sup>6</sup> The value of the calculated Chi-square statistic equals 34.77 and fails to exceed the Chi-square critical values at conventional tests of statistical significance.<sup>7</sup> Overall, one cannot conclude that hygienists' fees for adults are significantly different than the mean dentists' fees for adults.

*Fees for child prophylaxis.* Table 3 presents the evidence from the comparisons between fees for children.

For the remaining nine market areas, one cannot detect a difference between the hygienist's fee and the mean of the neighboring fees.

To assess the overall differences between all market areas regarding child prophylaxis fees, the same type of overall statistical test was constructed as described in the analysis of adult fees. The results indicate that overall, there is a statistically significant difference

**Table 3: Child Prophylaxis Fee Analysis**

Practice	t-value	Probability	Significance
B	9.650	0.011	Significant
C	4.792	0.001	Significant
D	0.486	0.634	Not Significant
E	0.240	0.814	Not Significant
F	0.901	0.378	Not Significant
G	1.566	0.146	Not Significant
H	0.079	0.938	Not Significant
I	0.577	0.622	Not Significant
J	1.905	0.115	Not Significant
K	2.259	0.058	Significant
L	1.383	0.204	Not Significant
M	0.279	0.789	Not Significant

For the children's fee calculations, there were three market areas (B, C, and K) in which the calculated t-value is statistically significant using a significance level of  $p = .05$ . Interestingly, in two of these markets the hygienist fees were greater than the mean of neighboring dental practices, and in one market the hygienist fee was less

between unsupervised hygienists' fees for children and the mean of dental practice fees.<sup>8</sup> Since this significance results because of three markets, and since the differences in the three markets are not in the same direction, one cannot determine the direction of the overall effect. Thus, it is not justified to conclude that unsupervised dental hygienist fees for children are lower.

### Other Practice Characteristics of Unsupervised Dental Hygienists

In addition to prophylaxis fee data, both hygienists and dentists were asked about several other practice characteristics that are presented in the following sections.

*Referral to practicing dentists.* In response to the question, "Is there a dentist there who can check for any problems so we don't have to schedule a separate visit somewhere else?" All of the unsupervised hygienist practices indicated that there were no dentists on site who would take care of any problems at that time. Regarding referrals, seven of the 14 responding practices indicated that they refer patients to dentists if any problems occur or are detected.

From the dentist telephone survey, dentists were asked if they were aware of the presence of any independent or unsupervised hygienists practicing in their community. Almost 64% of the respondent dentists were not aware of their presence. Thirty-nine percent of the dentists who said they were aware of unsupervised hygienists also said they had received a referral sometime, but only 12% said they received referrals regularly. Together, these findings suggest that interaction between dentists and independent hygienists is not extensive, either because hygienists see only a few

<sup>6</sup> See B. J. Winer, *Statistical Principles in Experimental Design*, McGraw-Hill: New York, 1962, pp. 43-45.

<sup>7</sup> The 34.77 is compared with 26 (2 times the number of t-values) degrees of freedom.

<sup>8</sup> The calculated Chi-Square equals 44.135 which is statistically significant at the 1% level of confidence.

patients in the area or that they focus their relationship with only a few dentists.

#### *Length of time to appointment.*

Unsupervised hygienists also were asked, “How long does it usually take to get an appointment?” Among the eleven unsupervised hygienists who responded to this question, four reported that it required less than a week for an appointment while four indicated it took a week to get an appointment, and three reported it took two weeks. The mean length of time until appointment was 7.7 days, and the median was 7 days.

Among the general practitioners surveyed in the same communities as the unsupervised hygienists, about 25% reported that patients could make an appointment for one week or sooner. Forty-two percent reported that the appointment wait was greater than three weeks. Among the responding general practitioners, the mean wait for an appointment was 29.9 days and the median wait was 14 days. A statistical test of the differences in mean appointment waiting times ( $p = .05$ ) failed to detect a statistically significant difference—that is, it cannot be concluded that the mean waiting time for an appointment with independent dental hygienists and dentists are different.

While not statistically significant, unlike fees, the difference is substantial and

merits some explanation. The shorter wait time for an appointment with an unsupervised private dental hygienist practice would be attractive to the patient. They could see the dental hygienist more quickly. However, for the hygienist, it would suggest that their appointment schedules are less busy than those of local dentists.

#### *Hours and days the practice is open.*

In response to a question of, “What are your hours?”, five of eight hygienists responding reported that they were open eight hours on their workdays. Only one of the respondents reported less than eight hours and no one reported more than eight hours. There was some variation regarding the number of days and the pattern of days the practices were open. The number of days open ranged from 2 to 7 days with a mean of 4 days and a median of 4 days.

The number of hours that hygienist practices were open per week was based on the number of hours open per day and the number of days open per week. Total hours open per week for the responding hygienists ranged from 8 to 40 hours. The mean number of hours open per week was 25 hours and the median number of hours was 28 hours.

Among general practitioners responding to the dentist survey conducted in the same communities as the unsupervised hygienists, the number of hours the practice

was open ranged from 8 hours per week to 66 hours per week. The mean number of hours the practices were open was 35.7 hours and the median was 36 hours per week.

*Use of radiographs.* In order to gauge the extent of services provided by unsupervised dental hygienists and their investment in dental equipment in addition to chairs, lights and instruments, they were asked if they provided radiographs. All but two of the seventeen unsupervised hygienists who responded to this question reported they provided radiographs in their practice.

## **DISCUSSION**

The results of the fee comparison confirm what the relatively few number of unsupervised private dental hygiene practice suggests. Patients are not able to realize significant saving from unbundling the services of the hygienist from those of the dental office. Hygienists and dentists in dental practices are able to provide preventive services at comparable fees. This works to the disadvantage of unsupervised private hygiene practice because as economic theory explains, their fees would need to be lower to make up for the disincentive that patients encounter from the need for two separate visits to health professions.

These analyses suggest that independent dental hygiene practice in Colorado is very



limited because that practice model does not offer a more efficient model for the delivery of preventive dental services over traditional dental hygiene practice. In addition, the model does not generate substantial economic incentives for dental hygienists to undertake the business risk of opening an independent practice.

Economic theory instructs that where the economic incentive of a business model is apparent, instances of that model will expand. This has not happened for independent dental hygiene practice in Colorado.

Since unsupervised hygienists' fees are not higher, the incentive for the hygienist to establish a private practice with the attendant investment requirements and business risk is very weak. If a hygienist can earn as much working in a dental office, that type of practice offers several advantages. Those in traditional practice do not have to worry over running a business. If snow shuts down the office, they are not the ones who will pay the staff for a day generating little revenue. They are not the ones who will have to negotiate the lease and replace obsolete equipment. They are not responsible for collecting accounts receivable.

Of course, some hygienists may prefer their own practice for personal reasons. They are the ones we observed in this study. Their own practice may provide a sense of independence. Each

is his or her own boss. These features are reasons that attract dentists to the profession, as well. However, if the financial attractiveness of dentistry disappeared, those features would soon lose their desirability for the majority of dentists, and likewise, for the majority of dental hygienists.

For all of these reasons, the business viability of independent hygienists is questionable since they must compete with dental practices that have the advantage of full economies of scope. The very small number of truly independent practices in the State of Colorado is further indication of questionable business viability.

Unsupervised private dental hygiene practice, as defined in the study, has not had a notable effect on access to care in Colorado. The reason is that the number of unsupervised hygienists is very limited, even after almost two decades during which unsupervised dental hygiene practice has been permitted in Colorado.

The 20 unsupervised dental hygienists identified in this study practiced an average of 25 hours per week. The total hours of care provided by these hygienists is estimated at about 500 hours per week. That amount of practice time is too small to have a material impact on access to dental services by any particular subgroup in Colorado.

In contrast, there were nearly 2,100 dentists practicing in Colorado in 2004. Using the average of 35.7 hours per week that responding dental practices were open, the total hours of care provided by dentists in Colorado is estimated to be approximately 74,970 hours per week.

Furthermore, the practices of the unsupervised hygienists were located primarily in areas with household incomes substantially above the average. Five of the unsupervised dental hygienist were located in counties identified by HRSA as partially designated shortage areas. However, only one practice was located in a low-income area of a partially designated county; the other four were located in high or middle-income areas of the designated counties.

It should be noted that even in affluent neighborhoods, a portion of patients in either a hygienist's or a dentist's practice could be disadvantaged. Nevertheless, even if unsupervised dental hygiene practices were focused completely on care for the disadvantaged, their impact on access to care for the disadvantaged would remain limited because lack of business viability translates into few individuals and limited hours providing care.